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ABSTRACT

The present state of the educational use of computer communications networks in Japan is outlined. Computer communication is now growing rapidly in Japanese society as a whole, and its educational community is not an exception. After giving general figures on the use of computers in Japanese education and describing government proposals on information networks for education, this paper summarizes different types of online educational activities. These activities include databases for instructional materials, information exchange and computer conferencing on some major networks, local and grassroots networks, and academic networks. Research activity on the use of educational computer communication is reviewed, and the need for further research is emphasized, especially on the psychosocial aspects of computer communication. Twelve figures illustrate the discussion. (Contains 29 references.) (Author/SLD)

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Educational Use of Computer Communication Networks in Japan: A Review of the Present Status

Hiroo Saga

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Educational Use of Computer Communication Networks in Japan: A Review of the Present Status

Hiroo Saga

Abstract

This paper outlines the present state of the educational use of computer communication networks in Japan. Computer communication is now growing rapidly in Japanese society as a whole, and its educational community is not an exception. After giving general figures on the use of computers in Japanese education and describing government proposals on information networks for education, this paper summarizes different types of on-line educational activities. It includes databases for instructional materials, information exchange and computer conferencing on some major networks, local and grassroots networks, and academic networks. Research activity on the use of educational computer communication is reviewed, and the need for further research is emphasized, especially on the psycho-social aspects of computer communication.

Keywords

computer communication, educational networking, distance education, computer conferencing, Japan.

Introduction

The purpose of this paper is to outline the present state of computer communication in Japanese education. To begin with, general figures on computer utilization in Japanese schools are summarized briefly.

Compared to many countries in Europe and North America, Japan was relatively slow in introducing microcomputers into schools. Beside universities and technical senior high schools, Japanese primary and secondary schools began to purchase microcomputers at around the middle of 1980's. In January 1983, when the Ministry of Education, Science and Culture conducted its first such nation-wide survey, microcomputer diffusion rates were 0.1% in elementary schools, 1.8% in junior high schools and 45.6% in senior high schools (Inoue, Saga, & White, 1987). According to the most recent survey by the Ministry made in March 1989, these figures had increased to 21.0%, 44.8%, and 96.3% respectively. During the initial stage, computers were used mainly for

school management and drill and practice type of instruction. However, it has been gradually recognized that computers should be used in a variety of ways in which students use them as learning tools and teachers integrate them as one of their instructional resources. It was also becoming more apparent that they were being connected to communication networks for use in information exchange and database searches.

At the same time, within society as a whole, there has been a great deal of progress in linking computers with communication networks. Individual utilization of electronic bulletin board systems (BBS) and participation in various computer conferences are becoming ever more popular and on-line databases are being rapidly developed. According to a survey by the Ministry of Post and Telecommunication in the spring of 1989, today in Japan there are nearly twenty major, public, nation-wide computer networks which are being used by upwards of 300,000 people. In addition, there are over two thousand local networks, to include even small host stations being operated by junior high students from their own homes.

To date, most computer communications efforts in the field of education have existed as sub-sections or special interest groups (SIGs) of the nation-wide commercial networks. In fact, many of them have been supported by personal efforts of voluntary moderators, many of whom are school teachers. Besides this, a few examples of independent computer communication networks have been developed to date. The first computer network established by a public service educational organization was AV-PUB (Audiovisual Public Board). This system is maintained by the Japan Audiovisual Education Association, a public foundation. A number of local educational organizations have also established regional computer networks for use in their immediate, surrounding areas. The Ministry of Education, Science and Culture has, in 1987, begun furnishing financial assistance for the construction of local-level educational information networks of this type. In some schools the students themselves, as part of their learning activities, are using computers to communicate with other schools, sometimes even schools in other countries. In addition to these user-participating networks, there are also a number of networks which provide academically-oriented databases for universities and research institutes. International data circuits make it possible for users in different fields to also access networks and databases outside Japan.

Information Network Proposals

As a background of the trend outlined above, a number of reports concerning educational information networks were published by government councils during 1987. The National Council for Educational Reform, established in 1984

as an ad hoc council responsible directly to the Prime Minister, published its Third Report on Educational Reform in April 1987, and then its Final Report that same August. Among the various points emphasized by this Council, it was emphatically pointed out that Japanese education needs to adapt to the ever-progressing information society. In April 1988, a more concrete proposal for the development of information networks was presented by the Committee on Educational Media of the Social Education Council, Ministry of Education, Science and Culture in a report on "Life-long learning and the New Media."

1. Educational Computer Networks

The last-mentioned report stated that a wide range of media should be used in support of life-long learning activities and recommended the establishment of such systems in various localities. The primary aim of this report was to develop a number of models which could be applied to realistic situations where educational networks are to be established. Two of the more representative of the nine models outlined in the report are presented below.

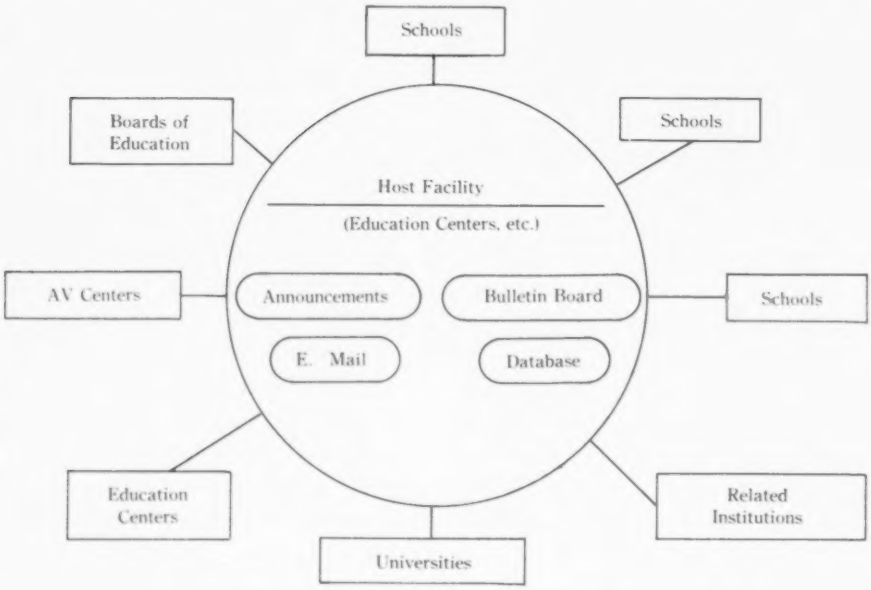
Figure 1 is a model for a "Regional School Information System." Designed for use by both schools and teachers, it provides schools and teachers with information on a variety of instructional materials which can be beneficial to school education in a certain region. This model is also designed in such a way as to provide free mutual exchange of information between participants. The host computer to manage these functions is to be located in an education or audiovisual center in the region. Figure 2 is a model for a "Nation-wide Audiovisual Education Material System" which would provide local audio-visual centers and libraries with information on various types of audiovisual materials for use in school and community education. Like the other models, it also offers means for exchanging information among participants via computer. The AV-PUB system mentioned above is based upon this model.

2. "Intelligent" Schools and Facilities

Returning again to the National Council for Educational Reform, its Third Report in 1987 called for educational, cultural, and research facilities to be made "intelligent." Note should be taken of the use of the term "intelligent school," a phrase which may be considered to symbolize this report. Its use was not limited to formal schools alone ; it was meant to also be closely related to community education. According to this report, making an educational facility "intelligent" means (1) providing conditions which fully incorporate the potentials of the new communication media, (2) establishing an environment both naturally and culturally rich, ensuring that there is always a sense of ample and aesthetically tasteful space, and (3) promoting multiple and multipurpose utilization of the facilities in local regions. These proposals designed to harmo-

Figure 1. Regional School Information System

Scope : Local/Regional Level
Area : School Education
Purpose : Supplementary Information on School Learning Sources

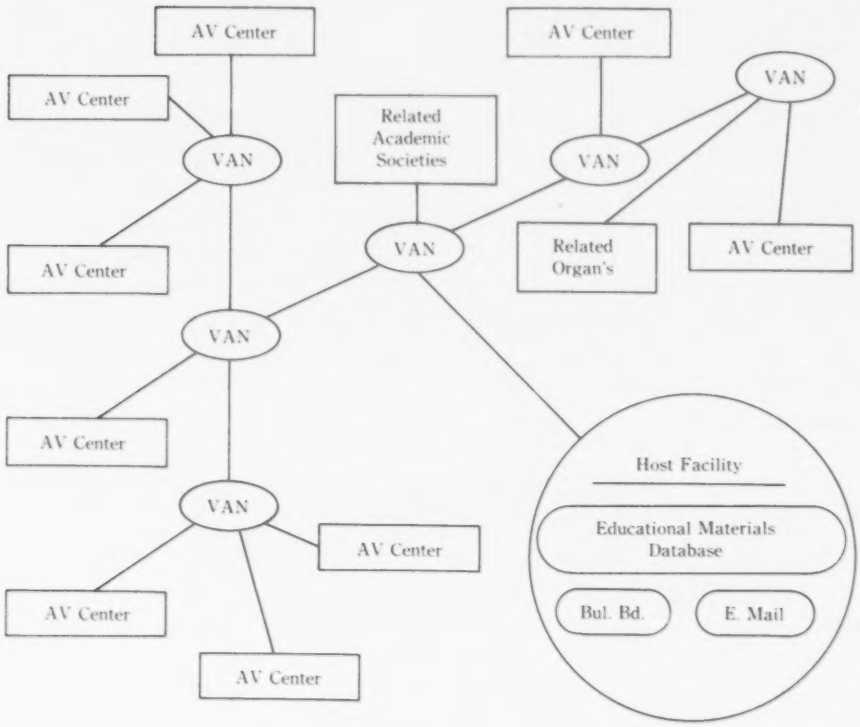


Information Provided

Announcements	Bulletin Board
(General Information) System Utilization Guide Board of Education News Training Session Info. Educational Events and Activities etc.	(Temporary Information) School News (by type/level) Subject Matter Reports(") Academic Society News AV Center Information Education Center Information Exchages Between Students etc.
Electronic Mail	**Data Base**
(Individual/Institutional Information Exchange) Information Exchange Administration Liaison etc.	(Semi-permanent and Permanent Information) Subj. Matter Material Lists AV Material Lists Supplementary Reading List Educational Statistics etc.

Figure 2. Nation-wide Audiovisual Education Materials System

Scope : National Level
Area : School and Social Education
Purpose : Supplementary Information on School Learning Sources



Information Provided

Instructional Materials Database	Electronic Bulletin Board	Electronic Mail
Search by— Grade Level Subject Matter Keyword(s) Year Published Publisher Type of Media etc.	Introduction of New Materials Organization and Study Ass'n News Information on Use of Material Evaluation of Materials Administrative Directives etc.	Information Exchange Administrative Liaison Coordination of Activities and Events etc.

nize high technology and sensitivity to human environment as well as those which aim at the promotion of greater degrees of flexibility in the utilization of all types of facilities, have influenced many sectors of education to design the schools and community education facilities of the future.

In August 1987, final report of the National Council for Educational Reform, building upon the previous reports, emphasized the need for the educational system of the future, as a whole, to be designed from the viewpoint of life-long education. It also again pointed out the dire necessity for developing means for coping with the coming information age. In the report's own words, "In the future, based upon a thorough appraisal of all that will be beneficial as well as detrimental in the coming age of information, it is necessary to strive towards the building of an information society which manifests a rich humanitarianism and is fully capable of harmoniously combining the natural environment and the traditional culture." The Council also pointed out the need to (1) promote morals and personal ethics for one's behavior in electronic environments, (2) construct model systems appropriate to the coming age, (3) rationally apply the many and varied modes of information available, and (4) develop information-rich instructional environments.

Types of On-line Educational Activities

Different on-line activities in the present Japanese educational field are summarized below into the following three categories: First, a network for audiovisual materials information is described as a typical public-funded example. Second, teachers' activities in some general networks are presented. Third, other networks are covered including local, grassroots networks, and academic networks.

1. AV-PUB: A Computer Network for Audiovisual Education Materials

The development of a nation-wide audiovisual educational materials information network by the Japan Audiovisual Education Association was possible with financial assistance received from the Ministry of Education, Science and Culture during 1987. This information network consists of two parts, an "Audiovisual Materials Database" and an "Audiovisual Education Bulletin Board." The System is designed so that anyone from anywhere in Japan, using only a personal computer connected to the telephone, will be able to search for required audiovisual materials, locate data on the newest educational materials and equipment, seek information on research activities and conferences, read reports on media utilization, and so on. Mutual information exchange between participants is also possible with the bulletin board section of the system. Called AV-PUB (Audiovisual Public Board), its experimental utilization was

Figure 3. Overall Configuration of AV-PUB

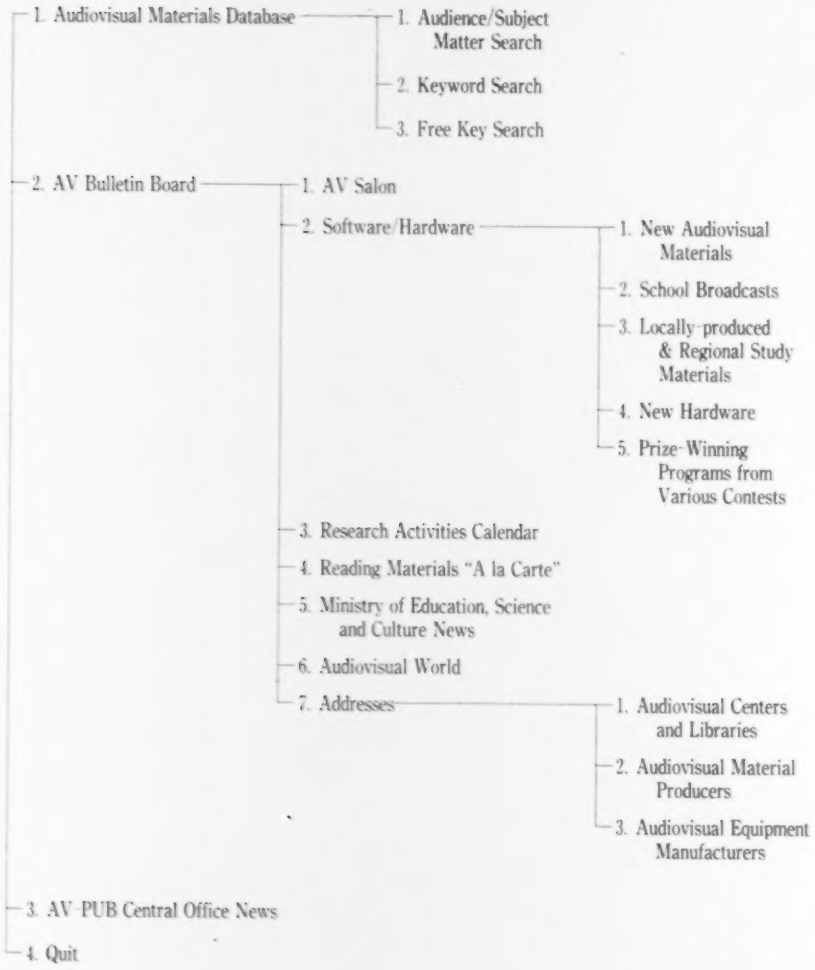
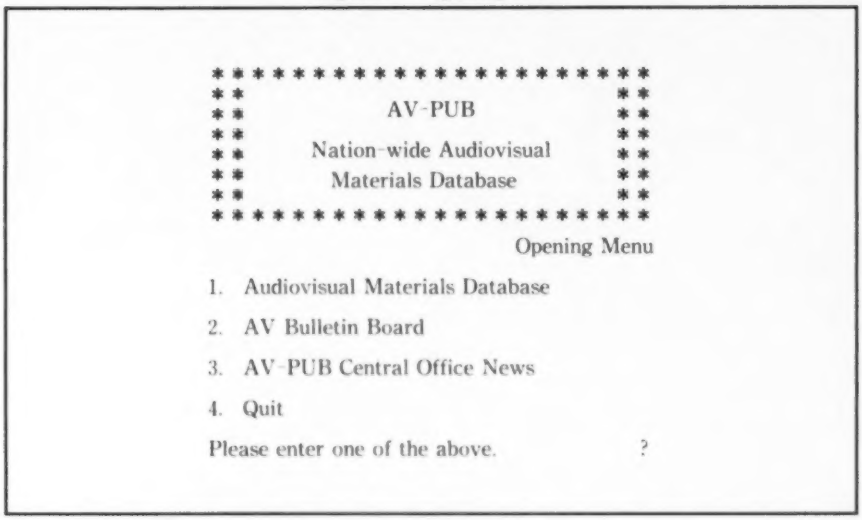

1. Audiovisual Materials Database
1. Audience/Subject Matter Search
2. Keyword Search
3. Free Key Search
2. AV Bulletin Board
1. AV Salon
2. Software/Hardware
1. New Audiovisual Materials
2. School Broadcasts
3. Locally-produced & Regional Study Materials
4. New Hardware
5. Prize-Winning Programs from Various Contests
3. Research Activities Calendar
4. Reading Materials "A la Carte"
5. Ministry of Education, Science and Culture News
6. Audiovisual World
7. Addresses
1. Audiovisual Centers and Libraries
2. Audiovisual Material Producers
3. Audiovisual Equipment Manufacturers
3. AV-PUB Central Office News
4. Quit

Figure 4. Opening Menu



started between a number of local education and audiovisual centers in February 1988 and regular service was initiated that same July (JAVIC, 1988). As of November 1989, a total of 210 institutes and/or individuals have been enrolled in the system.

a) *Outline of the AV-PUB System*

An outline of the overall configuration of AV-PUB is shown in Figure 3. At each level, users may select the item(s) desired from menus displayed on their own terminals. The opening menu, displayed upon logging into the host system, it shown in Figure 4. AV-PUB is designed to be basically a menu-driven system. This was planned for ease of use even for new-comers to computer communication.

The host computer, using a UNIX operating system, is a Convergent Corporation 32-bit minicomputer. Capable of processing Japanese as well as English, the computer functions as both a database and an electronic bulletin board. The telecommunication system can handle transmissions at either 1,200 or 2,400 bits/second and presently supports three receiving telephone lines but up to ten may be used. User terminals may be any personal computer or word processor with a telecommunications capability.

b) *Audiovisual Materials Database*

The audiovisual material database, one of the two major functions of AV-PUB, at present contains primarily data on 16mm films available in Japan. The user may conduct on-line searches from a number of different approaches. As of November 1989, the database contained information on approximately 4, 200 films and 35mm slides sets, all produced since 1975. In the future, information on videotape materials, videodisks, computer software will also be entered into the system. Figures 5 and 6 are the results of an actual search based upon

Figure 5. Results of a Search (Titles)

[Audiovisual Materials Database] Media : 16
Audience : Elementary Subject : Social Studies
Keyword :
Free Key :

1. Life in Warm Okinawa
2. The Life of People in Warm Climates-Okinawa
3. Life in Warm, Rainy Climates
4. Tokugawa Iemitsu and the Edo Bakufu
5. Kamakura As It Was : The Kamakura Gov't & Common Samurai
6. The Life and Work of Rice Farmers
7. City Life in Edo as Seen through the Ukio-e
8. Farmers who Raise Cattle-Husbandry in Kujuu Heights
9. Coastal Fishing-Fukueshima, Nagasaki Prefecture
10. Deep Water Fishing-Yaezu
11. Edo Period Cabinetwork
12. City Folk and Farmers-Mid-Edo Period
13. The World of the Nobility-Fujiwara Michinaga

Showing Results of Search Display : 1/76
List of Titles

using the categories "16mm film," "Elementary School," and "Social Studies." Figure 5 lists available titles while Figure 6 displays more detailed information from one of them. Searches may be conducted in one of several ways or in combination of them as described below.

Media: When using the system, search speed can be increased by selecting a specific media format from the Media Selection Menu. When one simply presses the return key, the system will search through all the media types at one

Figure 6. Results of a Search (Detailed Data)

[Audiovisual Materials Database] Media : 16
Audience : Elementary Subject : Social Studies
Keyword :
Free Key :

The Life of People in Warm Climates-Okinawa
Media : 16 Year : 1986 Standards : 20min/color
Producer : Gakushu Kenkyusha Film/Software Tel : 03-726-8751

Contents : How people adapt to living in warm climates.
Also, how climates affect farming and other types of production. Okinawa is used as an example.

School or Group Type : Elementary NDC :
Subject Matter : Social Studies
Keys : Unique Regions Warm Regions Weather Production
Awards : Recommended by the Ministry of Education
Memo :

Showing Results of Search Display : 2/76
Specific Contents

time. The media items include 16mm Film, 8mm Film, Video Cassette, Video Disc, Concept Film, Slides, Overhead Transparency, Paper Theater, and Computer Software.

Audience and Subject Area: The database is also divided and coded by audience as well as by subject area. For school education, the audience categories are kindergarten, elementary, junior high, and senior high school; for community education they are nurseries, juveniles, youth, and adults. Subject matter categories for school education are based upon the school curriculum while those for community education refer to content. These codes are displayed and selected from menus and, by entering the codes desired, the user can quickly search for a variety of educational materials appropriate to the intended audience and subject area.

Keyword Search: Users can also put keywords describing the contents of required materials in the specific field of the search screen. One to three keywords are possible to be used during any single search. These keywords may be connected by either "and" to narrow or "or" to expand.

Free Key Search: It is also possible to enter "free keys," by which all the data fields are searched through. One to three free keys connected by either "and" or "or" may be used at one time. This approach, though takes a longer time, permits very flexible searches of all the fields of information.

c) *AV Bulletin Board*

AV-PUB's electronic bulletin board, the second major function, offers a variety of information as well as permitting users to freely exchange experiences and opinions related to audiovisual education. The bulletin board's menu, accessed from the top menu, is shown in Figure 7. It has, at present, seven sections, some of which also have a number of sub-sections. Some sections of the bulletin board will accept users' inputting of their message while others are "read-only." By entering a specific section, one may review a list of titles on file, read any of the messages contained therein, and, for some sections, send one's own messages. Figure 8 is a sample list of titles taken from "Audiovisual World" section; Figure 9 displays the contents of one of these notes. The seven bulletin board sections are as ollows.

AV Salon (Read/Write): Users may freely exchange opinions and information on any aspect of audiovisual education: for example, reports on the development and use of audiovisual materials, information on the management of local audiovisual centers, results of various instructional practices using media, notices from related organizations, research associations, and even personal opinions and individual requests.

Software and Hardware (Read Only): This section, provided by the host association and updated monthly, is divided as follows:

1) New Audiovisual Materials

Figure 7. Bulletin Board Menu

```
**************************
   Audiovisual Education Bulletin Board
**************************
                    Bulletin Board Menu

1. AV Salon
2. Sortware/Hardware
3. Research Activities Calendar
4. Reading Materials "A la Carte"
5. Tokyo News
6. Audiovisual World
7. Addresses
8. Main Menu
9. Quit

Please enter one of the above.      ?
```

Figure 8. Example of Bulletin Board Titles

• AV World/Number of Items : 12 Items/2 Pages

No :	Date	Lns	Title
0001	88/02/15	021	New Rules for Recruiting ICEM Ass't Member
0002	88/03/13	123	What Do We Know about Film Learning (1)
0003	88/03/13	134	What Do We Know about Film Learning (2)
0004	88/03/14	064	ICEM : "Survey on the Future Use of Media"
0005	88/03/14	129	Developing and Using Interactive Video (1)
0006	88/03/16	127	Trends in Research in Inst. /Educ. Tech (1)
0007	88/03/16	124	Trends in Research in Inst. /Educ. Tech (2)
0008	88/03/17	128	Reviewing the Effects of Media Educ. (1)
0009	88/03/17	127	Reviewing the Effects of Media Educ. (2)
0010	88/03/18	137	Report of U. S. Comm. on Educ. Tech. (1)
0011	88/03/18	128	Report of U. S. Comm. on Educ. Tech. (2)
0012	88/04/19	078	Instructional Goals : Sesame Street. 85-86

—— 1/1 ——

(M, S, F, <CR>, N, B, Rn, Q, H)
Please enter a command :

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Figure 9. Example of a Bulletin Board Item

```
5 Developing and Using Interactive Video (1)
 Date     Time   Lines  Pages  Submitted by
88/03/14  18:16  129    (8)    Saga, Hiroo
Synopsis :
        Developing and Using Interactive Video (1)
        Discovering Britain, BBC, "Domesday"
  "Interactive video, " combining videodisks and personal computers, takes advantage
of the power of images by providing a wide variety of learner-media interactions.
From the biginning, development has been aimed at educational use.
  "Domesday, " prepared by the British public broadcaster, the BBC, is based upon the
word "doomsday, i. e., the "last day of judgment." The "Domesday Book" is a record
of the census and survey of English landowners and their property made by the order
of William the Conqueror during the 11th Century.
                                    --- 1/8 ---
(M, S, F, <CR>, N, B, Rn, Q, H)
Please enter a command :
```

2) School broadcasting programs
3) Locally-produced and Regional Study Materials
4) New Hardward
5) Prize-Winning Programs from Various Contests

Research Activities Calendar (Read/Write): This section is used for exchange of information and publicity for various conferences, study meetings, exhibits and other events sponsored by research associations and organizations involved in audiovisual education.

Reading "A la Carte" (Read/Write): An outline of the contents of each issue of the monthly mangizine "Audiovisual Education," and reviews of a variety of documents and reports related to the field are included in this section. Users may also enter their own reviews on books and other materials.

Tokyo News (Read only): This section presents information mainly from the Ministry of Education, Science and Culture. It includes updates on recommended instructional materials, personnel transfers, outlines of various reports, related statistics, etc., in other words, information basic to the administrative aspects of education.

Audiovisual World (Read only): Information from the International Council on Educational Media (ICEM), descriptions of trends in educational media study in countries outside Japan, etc. are available in this section.

Addresses (Read only): This section has the following address lists, kept as supplemental information to the audiovisual Materials Database; 1) Audiovisual Centers and Libraries, 2) Audiovisual Materials Producers, and 3) Audiovisual Equipment Manufactures.

2. Educational Activities in General Networks

In Japan as of the spring of 1989 there were nearly twenty nation-wide computer networks established for broad, general public participation. Most of the larger networks have an education section. These are used primarily by teachers, staffs of local boards of education and those doing research in universities and elsewhere. The following are examples of some of the larger and more representative networks.

a) *PC-VAN*

PC-VAN is one of the largest of the commercial computer communications services in Japan. It has a wide range of bulletin boards and conferences in which several sections related to education are included. One of such computer conferences has been on "lifelong education." There are also special interest groups or SIGs for those with common interests and concerns. Active among these are "Education and Software" (STS, the SIG name), "Computer-Assisted Instruction Study Group" (CAI) and "Life and Education" (SMILE). Each SIG has a set of "Forums" for information exchange. The STS SIG now has twelve forums, while CAI and SMILE SIGs have six each. Each SIG also has a "Library" for retaining more permanent information, and the STS SIG even has a section for the exchange of participant-developed public domain software (Okada, 1989). Figure 10 shows the forum menus for each of these SIGs.

b) *NIFTY-Serve*

NIFTY-Serve is another large telecommunication network with some educational sections as part of its varied functions (Mizouchi, 1989). Among its large number of different computer conferencing, such educational forums as "CAI

Figure 10. PC-VAN "Forum" Menu-Three Selected SIGs

STS (Education and Software)			
1.	Lounge	2.	Practical Applications Room
3.	Study Room	4.	Library Room
5.	Students' Room	6.	Faculty Room
7.	Planning Room	8.	Developmental Room
9.	Evaluation Room	10.	Consultation Room
11.	Conference Room	12.	Broadcasting Room
CAI (CAI Research Group)			
1.	CAI Bulletin Board	2.	Activities/Events Guide
3.	CAI Requests	4.	Examples of CAI Applications
5.	Intro. to CAI Books	6.	Intro. to CAI Software
SMILE (Computers in Life and Education)			
1.	Life and Education	2.	My Software Evaluations
3.	Reports Room	4.	National/Local Conf. News
5.	Discussion Room	6.	Question Box-Problems & Answers

Forum," "'Temple Schools' of the Future," "Foreign Languages Forum," and the "Mainichi Newspaper Educational Forum" are operated. Unique to this network is the availability of search service of different newspaper articles. NIFTY-Serve also permits access to databases in the United States, to include those specializing in education. The "Mainich Newspaper Educational Forum" not only permits free exchange of information on a variety of problems found in modern education but also provides up-to-date information on various aspects of education as gathered by the newspaper's reporters. The menu for the "Mainichi Newspaper Educational Forum" is shown in Figure 11.

c) *Other Networks*

A number of other commercial networks also have educational sections. Organized by a publishing company, "Nikkei MIX" was developed primarily as a computer conferencing system. A number of its conferences have been related to the field of education. "TWICS-BeeLine" is a commercial English language service which utilizes a computer conference system and presently has an ongoing computer conference called "Talk Education." It is unique in that many of its participants are foreigners living in Japan. Since this system links to some American networks, its educational conference is sometimes international in scope.

3. Educational Networks in Local and Specialized Fields

In addition to the above cases which utilize general networks for their educational activities, there are also a number of smaller local networks

Figure 11. Mainiche Newspaper Educational Forum Menu

〈Mainichi Newspaper Educational Forum〉 FMAI

1. Notices
2. Bulletin Board
3. Computer Conf.
4. Data Library
5. Info for Members
6. Real-Time Conf.
7. Letters to SYSOP
8. Exit

>4

No.	Total	Entered	Newest Date	Library Title
1	51	(51)	08/22	General Information
2	9	(9)	08/22	Elementary Schools
3	5	(5)	08/22	Junior High Schools
4	9	(9)	08/19	Senior High Schools
5	12	(12)	08/19	Universities/Colleges
6	2	(2)	08/19	Junior Colleges
7	2	(2)	08/25	Technical & Misc. Schools
8	2	(2)	08/25	Schools for the Handicapped
9	2	(2)	08/25	Higher Technical Schools

developed for educational communities. Some prefectural boards of education have also established their own computer networks. For researchers at universities and other institutes, on-line databases and mail exchange systems are available and used more extensively.

a) *Grassroots Networks*

There are already a number of local networks which are being maintained by various groups and municipalities. Since many of these are supported by voluntary efforts of particular people and organizations, they are often called "grassroots networks." In the Sapporo metropolitan region, Hokkaido Prefecture, for example, there is a network called "ANT" (Active Network of Teachers) designed for those involved in education (Shioda, 1988). While in Sendai City, Miyagi Prefecture, the municipal "Sendai Kominetto" (Communication Net) has a section sponsored by a teachers' research group. In Tsuchiura City, Ibaraki Prefecture, an "Inter-school Experimental Network" has been opened. In the region around Asahi City, Chiba Prefecture, there is an "Asahi Municipal Region Educational Data System" in operation. This system provides on-line graphical, statistical data for use as school instructional materials as well as photographs and pictures (Asahi Educational Information Center, 1986). The network serving the area surrounding Fukui City, Fukui Prefecture, has its host computer located in the Fukui Municipal Audiovisual Center and provides information on instructional materials and in-service courses at the Center (Masunaga, 1988). COARA, a network in Oita City, Oita Prefecture, and nearby communities is one of the most active of all such networks in Japan, and has conferences on raising infants and education.

Hasumi (1989), one of the most active teachers in networking, adds to the above list the following grassroots networks; AYUMI-NET in Sendai City, Miyagi Prefecture, run by a local computer store and participated by teachers; Hamanasu-NET in Takahagi City, Ibaraki Prefecture, managed by a private evening school; UDAIFUCHU BBS in Ustunomiya City, Tochigi Prefecture, operated by teachers at the Junior High School of Utsunomiya University; LETS TALK BBS in Tatebayashi City, Gumma Prefecture, run by a teachers' group; Miotsukushi BBS in Choshi City, Chiba Prefecture, managed by a high school teacher; Saitama Prefectural Education Center BBS in Fukaya City, established by a public institute; LOGO-Net in Tokyo focusing on the use of LOGO in education; ASIJ BBS in Tokyo operated by students of the American School in Japan; Niigata NET in Niigata City, Niigata Prefecture, jointly operated by Niigata University and Niigata City Education Center; Computer Education BBS in Anjo City, Aich Prefecture, focusing on computers and education; Newton Network in Kyoto City run by the Kyoto Teachers' Association for Educational Technology; Ishikawa NET in Kanazawa City, Ishikawa Prefecture, managed by the Ishikawa Teachers' Association for

Educational Technology ; UJO-NET in Okayama City, Okayama Prefecture, participated by the Okayama Teachers' Association for Educational Technology ; ND-NETWORK in Kurashiki City, Okayama Prefecture, operated by two teachers of a Girls High School ; and Ehime Science Techers NET in Ehime Prefecture run and participated by high school science teachers. One should note that this is not a complete list and it is almost impossible to make such a list without a nation-wide survey.

b) *Prefectural Learning Information Networks*

Prefectural Learning Information Networks designed to support life-long educational activities were established in 1987 in Gumma and Hyogo Prefectures, followed by Osaka and Ehime Prefectures in 1988. These were made possible with assistance received from the Ministry of Education, Science and Culture's funds for "Developing Learning Information Systems." These projects are designed to promote life-long educational opportiunities at the prefectural level as well as to provide individual assistance through the offering of advice and, via computers, the furnishing of information on study opportunities to local residents. Four more prefectures are selected to receive funds under this program in 1989.

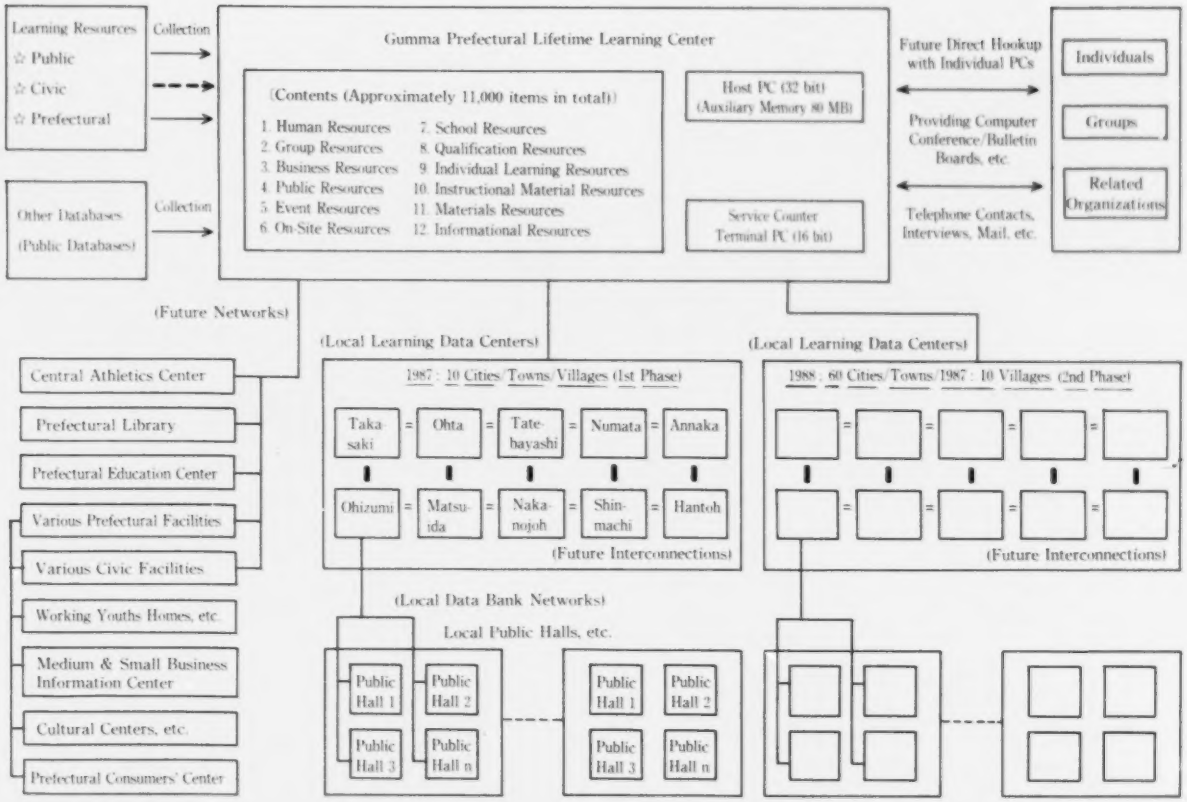
As an example, Figure 12 summarizes the system established by Gumma Prefecture. Located in the Prefectural Life-long Learning Center, the host computer already has over 10,000 items on guidance personnel, study groups and organization, use of study facilities, learning activities, exhibits and events, and other learning resources. Regional adult learning centers have been established in various areas within the prefecture and are connected to the host computer by telephone circuits. In addition to increasing the number of regional centers available, plans are also being made for expanding the network to include other institutions and interested individuals.

The basic concepts behind the organization of the Hyogo Prefecture Learning Information Network are similar to those for Gumma Prefecture. The host computer is located in the Prefectural Life-long Education Center and connected by telephone circuits to computer terminals at public halls and other facilities in various areas. Supported by a variety of on-line data sources, these facilities are able to respond to public requests for advice on learning opportunities. Based upon a preparatory prefecture-wide study titled "Survey on Desirable Learning Information," the data intially entered into this database is mostly information on guidance personnel, facilities, study groups, study projects and other topics for which the survey showed there were high levels of demand (Tabuchi, 1988).

c) *Academic Networks*

In the academic field, there are several networks being used by researchers in universities and other research institutes. It was in 1981 when a nation-wide

Figure 12. Gumma Prefecture's Learning Information Network



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computer network, called Inter-University Network, became operational, connecting seven large computer centers at major universities. At present, more than sixty universities are connected to this network, using it for information retrieval and scientific computing. Kikukawa, Kawafuchi, & Isomoto (1983) installed a database of informations on audiovisual education materials to this system. Tsukuba University has been operating its on-line information retrieval service called UTOPIA (Nakayama, 1984). National Institute of Education, in Tokyo, has been operating an on-line database for educational research articles (Murase, et. als., 1986). JUNET (Japanese University/UNIX network), started in 1984, is a new network which emphasizes elactronic mail and news exchange, and participated by about 200 institutions (Ishida, 1989). BITNET, an American network, is also connected to fifty Japanese universities (Matsuda, 1989), which then is interlinked to JUNET.

Another important academic network is run by NACSIS, or National Center for Science Information System in Tokyo. In 1985, the University Library Network came into operation for the on-line compilation of a union catalog of monographs and serials. NACSIS was established in 1986 based upon this project. NACSIS now provides on-line databases, called NACSIS-IR, for handling a variety of documents for universities and research institutions. In 1988 it was operating a total of 19 databases. Representative among these were "Life Science Collection," "COM-PENDEX," "SciSearch," "Social SciSearch," "JPMARC," "LCMARC (Books)," and "LCMARC (Serials)." The Academic Information Center System also provides a national electronic mail service for universities and research institutions throughout Japan (NACSIS, 1988).

Research on Educational Use of Computer Communication

Compared to the rapid growth of different educational networks, research activities on the use of such systems have not fully matured. There has appeared a considerable amount of information on individual experiences of using these networks and the developmental processes of such systems, but research analyzing the process and different aspects of on-line communication has just started.

Shiosaki (1988) and Saga (1988) became international students of AOU (American Open University) idenpendetly to each other and reported their personal experiences for on-line learning. AOU is a distance education university managed by New York Institute of Technology which utilizes computer conferencing as a teaching medium (Deutshman, et. als., 1985 ; Meeks, 1987). Saga (1989) describes and evaluates an on-line activity by students of distance education. In this study, a telecommunication club was organized at the National Institute of Multimedia Education for the students of the University

of the Air, Japan, in order to examine the possibilities and problems of computer conferencing between the long-distance learners. The author evaluates the result in terms of the needs of students, technical and social problems of on-line exchange, and the role of moderator, emphasizing the potential of this medium for giving students a sense of belonging to the University and the peer students.

Among many school teachers who use computer communication, the most active has been the group of participants of the STS SIG in PC-VAN. They have recently compiled different aspects of their on-line activity into two books (STS, 1989a ; STS, 1989b). With these books, they offer a set of public domain instructional software which have been developed by them in their SIG. The STS SIG has also been active to let their students in different classes exchange through the network.

Cohen and Miyake (1986) used international networking for cross-cultural exchanges between students in Japan and some other countries. They found that such exchanges serve as a basis for creating various functional learning environments. Ito and Kawai (1989) discuss the educational implication of international computer network with the case of The Time Network Systems (TTNS), a British network, in which nearly forty Japanese schools are enrolled. Within a national network, as well, Murase (1989) used on-line real time computer exchange for science learning. In this study, sixteen elementary and Junior high schools from Hokkaido Prefecture to Okinawa Prefecture participated in measuring the time and related factors of the sun reaching to the due south. The participating students could feel actually the time flow of the earth turning round while they were waiting for next schools in the west to send the message of the sun reaching to the due south.

A more experimental study on computer communication is reported by Sannomiya (1989), in which human dialogues with telephone, letters, and computers were compared and analyzed. She found that computer communication stands between telephone and letters in terms of some social aspects of human communication. Yoda (1989) analyzed interaction process of college students using computer conferencing and obtained some practical guidelines for effective moderating.

Concluding Remarks

As outlined above, educational use of computer communication networks is rapidly growing in Japan. There is a considerable amount of effort by teachers and researchers building and maintaining various educational networks. Public organizations, including the Ministry of Education, Science and Culture and Prefectural Boards of Education, are supporting some of these projects. As a

facilitating factor behind this, the design and maintenance technology of computer communication network has been greatly improved during the initial stage of its introduction. However, there remain some difficulties as well. For example, the technical environment starting computer communication is not still easy enough for many beginners. But more important, here, are the psycho-social aspects of communication rather than its technical conditions. Very little knowledge has been obtained so far in terms of effective on-line communication and learning, and the negative effects, if any, of computer communication. Research in this field has just begun. In order to be both practical and insightful, we need to conduct a wide variety of research including both descriptive research in a naturalistic situation and experimental research in a controlled setting. It is through continuous efforts of this type that we will have access to a richer environment for learning and teaching.

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